(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 072 647 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.06.2009 Bulletin 2009/26

(51) Int Cl.:
D01H 5/74 *(2006.01)* ***D01H 5/78*** *(2006.01)*

(21) Application number: **08020233.6**

(22) Date of filing: **20.11.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **21.12.2007 JP 2007330694**

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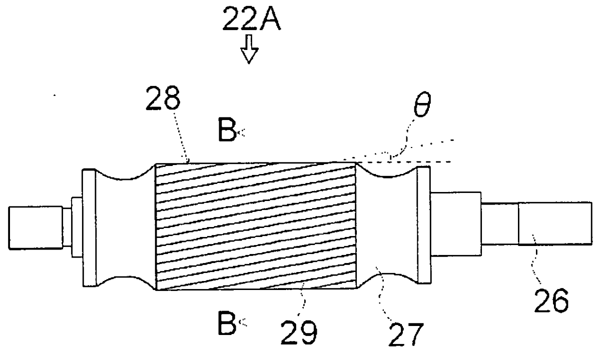
(54) Draft roller

(57) Irrespective of the material (yarn type) of a sliver to be processed, a generation of the cyclic unevenness caused by a groove pitch of a draft roller and an accumulation of foreign materials in the grooves during drafting process can be prevented. A draft roller according to the present invention is provided in a draft device of a spinning machine and has groove parts (29) formed on a roller surface (28) of the draft roller and having an inclination relative to an axial direction of the draft roller, wherein given that a diameter of the draft roller is R, the number of the groove parts is N, an inclination relative to the axial direction of the groove parts is θ, a fiber width of a sliver processed by the draft device is D and a circular constant is π, the draft roller satisfies a relationship $\pi R/N < D\tan\theta$.

Fig.3



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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a draft roller provided in a draft device of a spinning machine.

BACKGROUND ART

[0002] Conventionally, in a draft device used in a high-speed spinning machine, pairs of draft rollers including a back roller pair, a third roller pair, a middle roller pair and a front roller pair are sequentially disposed from an upstream side to a downstream side of the device. Each pair of draft rollers is formed of a driving roller rotated by a driving source and a driven roller driven in contact with the driving roller. The driving roller is a metal roller and the driven roller is a rubber roller. A sliver is drafted while being held between the driving roller and the driven roller in a vertical direction.

[0003] The draft device makes the sliver thin by a difference in speed between pairs of draft rollers. For this reason, to reliably hold fibers, grooves are formed on a circumferential surface of the driving roller of the pair of draft rollers.

[0004] However, when the grooves are formed on the circumference of the roller, a cyclic unevenness having the same cycle as groove pitch is applied to the sliver by convex parts of the grooves. In particular, depending on the material for the sliver (for example, cotton or chemical fiber) and the number of grooves of the third roller, a cyclic unevenness caused by the grooves of the third roller is extended when the sliver is drafted between the middle rollers and the front rollers. Thus, the processed sliver becomes a line of yarn having a cyclic unevenness with a few cm pitch. If such line of yarn is used as a weft yarn of fabric, a pattern like grain disadvantageously appears in the fabric.

[0005] The above-mentioned problem is caused by a fact that the sliver is held in the convex parts of the grooves formed on the circumference of the draft roller at uniform pitches and periodically pulled out, so that the cyclic unevenness is applied to the sliver and the sliver with the cyclic unevenness is extended through drafting process, resulting in that the cyclic unevenness is similarly extended. Therefore, in a draft roller disclosed in, for example, Patent document 1, by forming the grooves on the circumference of the roller at nonuniform pitches to change the cycle at which the sliver is pulled out by the grooves, spun yarn having no cyclic unevenness can be obtained without causing the cyclic unevenness in thickness.

[0006] However, since the draft roller in Patent document 1 has nonuniform groove pitches, as compared to the draft roller having the uniform groove pitches, processing is more complicated and costs are higher.

[0007] As described above, the cyclic unevenness caused by the groove pitch of the draft roller is generated by a fact that the sliver is held in the convex parts of the grooves and cyclically pulled out. For this reason, by increasing the number of grooves formed on a roller surface and making the surface of the convex parts of the grooves smaller, the cyclic unevenness can be prevented from generating. However, when the number of grooves is increased, since the grooves become finer and a cross-sectional area of grooves becomes smaller, foreign materials such as cotton sugar, residue and the like are easy to accumulate. As a result, winding and holding force of fibers on the roller is lowered, deteriorating yarn physical properties. For this reason, it is necessary to increase the number of grooves formed on the roller surface, while increasing the cross-sectional area of grooves. Furthermore, the frequency of cyclic unevenness applied to the sliver varies depending on the material for the sliver and the number of grooves formed on the third roller. For example, when the third roller having a small number of grooves (for example, 56) is used for cotton, no cyclic unevenness generates. On the other hand, when such a third roller is used for chemical fiber, the cyclic unevenness generates. In addition, an accumulation of foreign materials in the grooves varies depending on the material for the sliver and the number of grooves formed on the third roller. For example, when the third roller having a large number of grooves (for example, 120) is used for chemical fiber, foreign materials are not accumulated in the grooves. On the other hand, when such a third roller is used for cotton, foreign materials are accumulated in the grooves. Thus, in a conventional draft device, to prevent a generation of the cyclic unevenness and the accumulation of foreign materials in the grooves, several types of draft rollers having different number of grooves are used depending on the materials (yarn type) of the sliver.

[0008] However, each time the material for sliver to be processed is changed, the above-mentioned draft device needs to change the draft roller according to the sliver, which is troublesome.

[Patent document 1] Japanese Unexamined Patent Publication No. 1991-124820

SUMMARY OF THE INVENTION

[0009] To solve the above-mentioned problems, the present invention provides a draft roller which can prevent a generation of the cyclic unevenness caused by groove pitch in drafting process and the accumulation of foreign materials in grooves irrespective of the material (yarn type) of sliver to be processed.

[0010] A draft roller according to a first aspect of the present invention is provided in a draft device of a spinning machine and has groove parts formed on a roller surface of the draft roller and having an inclination relative to an axial direction of the draft roller, wherein given that a diameter of the draft roller is R, the number of the groove parts is N, an inclination relative to the axial direction of the groove parts is θ, a fiber width of a sliver processed by the draft device is D and a circular constant is n, the draft roller satisfies a relationship $nR/N < D\tan\theta$.

[0011] The draft roller according to a second aspect of the present invention according to the draft roller according to the first aspect of the present invention, wherein given that a cross-sectional area of the groove part is A mm^2, A falls within a range of $0.15 < A < 0.30$.

[0012] The draft roller according to a third aspect of the present invention according to the draft roller according to the first or second aspect of the present invention, wherein given that a depth of the groove part is F mm, F falls within a range of $0.30 < F < 0.45$.

[0013] The draft roller according to a fourth aspect of the present invention according to the draft roller according to any of the first to the third aspects of the present invention, wherein given that a width of a bottom surface of the groove part in the roller circumferential direction is T mm, T falls within a range of $0.25 < T < 0.45$.

[0014] According to the first aspect of the present invention, if the draft roller satisfies a predetermined relationship ($nR/N < D\tan\theta$), irrespective of the material (yarn type) for the sliver, a generation of the cyclic unevenness caused by a groove pitch can be prevented. Furthermore, irrespective of the material (yarn type) for the sliver, a structure of the draft rollers can be standardized. For this reason, processing and rearrangement of the draft roller do not cause additional trouble and costs.

[0015] According to the second aspect of the present invention, if a cross-sectional area of the groove parts of the draft roller falls within a predetermined range ($0.15 < A < 0.30$), irrespective of the material (yarn type) for the sliver, an accumulation of foreign materials (cotton sugar, residue and the like) in the groove parts can be prevented.

[0016] According to the third aspect of the present invention, if a depth of the groove parts of the draft roller falls within a predetermined range ($0.30 < F < 0.45$), irrespective of the material (yarn type) for the sliver, the accumulation of foreign materials (cotton sugar, residue and the like) in the groove parts can be prevented.

[0017] According to the fourth aspect of the present invention, if a width of the bottom surface of the groove parts of the draft roller in a roller circumferential direction falls within a predetermined range ($0.25 < T < 0.45$), irrespective of the material (yarn type) for the sliver, the accumulation of foreign materials (cotton sugar, residue and the like) in the groove parts can be prevented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a side sectional view of a spinning machine 100 according to an embodiment of the present invention.

Fig. 2 is a plan view showing relationship between a sliver 10 and grooves 29 of a third roller 22A.

Fig. 3 is a side view of the third roller 22A.

Fig. 4 (a) is a sectional view of the third roller 22A taken along B-B in Fig. 3 and Fig. 4(b) is an enlarged sectional view in the vicinity of the grooves 29 of the third roller 22A.

Fig. 5 is a side view of a draft device 2.

Fig. 6 is a chart showing measurements of a yarn evenness tester at the time when the sliver is processed by the draft device 2 having a conventional third roller 200A.

Fig. 7 is a chart showing measurements of the yarn evenness tester when the sliver is processed by the draft device 2 having the third roller 22A.

Fig. 8 is a table showing shapes of conventional third rollers 200A, 210A, 220A, and a third roller 22A according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] A spinning machine 100 according to an embodiment of the present invention will be described below.

Fig. 1 is a side sectional view showing a spinning machine 100 according to the embodiment of the present invention.

[0020] The spinning machine 100 has a sliver feeding unit 1, a draft device 2, a pneumatic spinning device 3, a yarn feeding device 4, a yarn defect detecting device 5 and a winding device 6.

[0021] The sliver feeding unit 1 includes a sliver case 11 for storing a sliver 10 as a raw material and a sliver guide 12 for guiding the sliver 10 to the draft device 2.

[0022] The draft device 2 has four pairs of draft rollers for holding and extending the sliver 10 therebetween. The four pairs of draft rollers are formed of a back roller pair 21, a third roller pair 22, a middle roller pair 23 and a front roller pair 24. The pairs of draft rollers are sequentially disposed along a feeding direction of the sliver 10 from an upstream side to a downstream side. An endless apron band 25 made of leather or synthetic rubber is wound around the respective roller of the middle roller pair 23. Each of the four pairs of draft rollers is formed of driving rollers (21A, 22A, 23A, 24A) rotated by a driving source not shown and driven rollers (21B, 22B, 23B, 24B) driven in contact with the driving roller. The driving rollers (21A, 22A, 23A, 24A) are metal rollers. The driven rollers (21B, 22B, 23B, 24B) are rubber rollers.

[0023] The driving rollers (21A, 22A, 23A, 24A) each rotate at different speeds, and by increasing a rotational speed of the driving rollers in the order of the back roller pair 21, the third roller pair 22, the middle roller pair 23 and the front roller pair 24, difference in speed between the pairs of draft rollers is provided. A draft ratio as a ratio for drafting the sliver 10 is determined depending on the difference in speed between the pairs of draft rollers. A draft ratio between the middle roller pair 23 and the front roller pair 24 is larger than a draft ratio between the back roller pair 21 and the third roller pair 22. For this reason, a ratio at which the sliver 10 is extended between the back roller pair 21 and the third roller pair 22 is larger than a ratio at which the sliver 10 is extended between the middle roller pair 23 and the front roller pair 24.

[0024] The spinning device 3 is a pneumatic spinning device for manufacturing a yarn (fascinated yarn) 40 by applying swirling airflow to the sliver 10 drafted by the draft device 2.

[0025] The yarn feeding device 4 is a device for feeding the yarn 40 manufactured by the spinning device 3 to the winding device 6. The yarn feeding device 4 includes a delivery roller 41 and a nip roller unit 42. In the nip roller unit 42, one end of a lever 43 is provided with a nip roller 44 and the other end of the lever 43 is provided with a rotational axis 45. The rotational axis 45 is supported on a frame of the spinning machine 100. The nip roller 44 is rotatably supported around the rotational axis 45 so as to make contact with or separate away from the delivery roller 41.

[0026] The yarn defect detecting device 5 is a device for detecting a yarn defect of the yarn 40 while the yarn 40 is being fed towards the winding device 6. Based on the yarn defect detecting information obtained by the yarn defect detecting device 5, a yarn defect portion is removed, thereby preventing a defective yarn from being wound into a package 61. The yarn defect detecting device 5 is also provided with a cutter not shown for cutting the yarn 40 according to detection of yarn defect and a yarn joining device not shown for connecting both ends of the yarn 40 once cut for removal of the yarn defect portion.

[0027] The winding device 6 is a device for traversing the yarn 40 in an axial direction of a bobbin 62 and winding the yarn 40 into the package 61. The package 61 or the bobbin 62 is rotated by a driving force of the driving drum 63 and then, the yarn 40 is wound around the bobbin 62 to form the package 61.

[0028] Next, a configuration of a driving roller 22A (hereinafter referred to as a third roller 22A) of the third roller pair 22 will be described. Fig. 2 is a plan view showing relationship between the sliver 10 and grooves 29 of the third roller 22A. Fig. 3 is a side view of the third roller 22A. Fig. 4a is a sectional view of the third roller 22A taken along B-B in Fig. 3. Fig. 4b is an extended sectional view in the vicinity of the grooves 29 of the third roller 22A.

[0029] As described above, when a cyclic unevenness is applied by the third roller 22A, the applied cyclic unevenness is further extended due to subsequent drafting process. Therefore, the cyclic unevenness caused by the third roller 22A needs to be prevented. As shown in Fig. 2a, the cyclic unevenness generates when a tip end 10a of the sliver 10 held by the third roller pair 22 is drafted in parallel with the grooves 29 of the third roller 22A. Accordingly, as shown in Fig. 2b, by inclining the grooves 29 of the third roller 22A by a certain angle θ with respect to a feeding direction of the sliver 10, the tip end 10a of the sliver 10 held by the third roller pair 22 is not located in parallel with the grooves 29 of the third roller 22A, thereby preventing the cyclic unevenness caused by the third roller 22A. From the above description, the third roller 22A has a following configuration.

[0030] The third roller 22A is a metal roller in which a shaft 26 and a roller part 27 having a larger diameter R than the shaft 26 are formed integrally. The grooves 29, 29, 29 ... having a predetermined inclination θ relative to the shaft 26 are formed on a roller surface 28 of the roller part 27 at uniform intervals. As shown in Fig. 4, the groove 29 is formed of convex parts 70, 70 and a groove part 71. The convex part 70 is formed of a convex surface 72 and inclined surfaces 73, 73.

[0031] N pieces of groove parts 71 are formed on the roller surface 28 at uniform intervals. The groove part 71 has a predetermined inclination θ relative to the shaft 26. The groove part 71 is formed of the inclined surfaces 73, 73 and a bottom surface 74. Here, a cross-sectional area of the groove part 71 (area taken along B-B in Fig. 3), that is, an area surrounded by the inclined surfaces 73, 73, the bottom surface 74, a virtual line 75 on the virtual surface extending from the convex surface 72 of the convex part 70 is defined as A mm^2. A cross-sectional shape of the groove part 71 is substantially trapezoid. A depth of the groove part 71, that is, the height from the bottom surface 74 to the virtual line 75 is defined as F mm. Furthermore, a width of the bottom surface 74 of the groove part 71 in a roller circumferential direction is defined as T mm.

[0032] Next, drafting process steps of the draft device 2 will be described.

Fig. 5 is a side view of the draft device 2.

The draft device 2 allows the sliver 10 to pass between the back roller pair 21 and the third roller pair 22 to perform a first stage drafting process. At this time, since the rotational speed of the third roller 22A as the driving roller is faster than the rotational speed of the back roller 21A as the driving roller, the sliver 10 is drafted.

[0033] The draft device 2 allows the sliver 10 to pass between the third roller pair 22 and the middle roller pair 23 to perform a second stage drafting process. At this time, since a rotational speed of the driving roller 23A (hereinafter referred to as a middle roller 23A) of the middle roller pair 23 is faster than the rotational speed of the third roller 22A, the sliver 10 is further drafted.

[0034] Furthermore, the draft device 2 allows the sliver 10 to pass between the middle roller pair 23 and the front roller pair 24 to perform a third stage drafting process. At this time, since a rotational speed of the driving roller 24A (hereinafter referred as a front roller 24A) of the front roller pair 24 is faster than the rotational speed of the middle roller 23A, the sliver 10 is further drafted.

[0035] Next, spun yarn was actually manufactured by using each of the draft device 2 having a conventional third roller 200 and the draft device 2 having the third roller 22A according to an embodiment of the present invention, and the quality of the manufactured yarns is compared. Fig. 6 is a chart showing measurements of a yarn evenness tester when the sliver is processed by the draft device 2 having the conventional third roller 200A.

Fig. 7 is a chart showing measurements of the yarn evenness tester when the sliver is processed by the draft device 2 having the third roller 22A.

[0036] For a comparative object, a roller having a diameter of 25 mm, 56 groove parts and an inclination θ of 5 degrees relative to an axial direction of the groove parts was used as the conventional third roller 200A. A roller having the diameter of 25 mm, 72 groove parts and an inclination θ of 10 degrees relative to the axial direction of the groove parts was used as the third roller 22A. A fiber width of the sliver 10 to be processed was 7.0 mm. As processing conditions of the draft device 2, a draft ratio (IDR) of the third roller to the middle roller was set to 1.715, a draft ratio (MDR) of the middle roller to the front roller was set to 35, and a tensile strength of the delivery roller 41 is set to 0.96.

[0037] The sliver 10 is held and pulled out by the convex parts 70 of the grooves 29. For this reason, the cycle of a cyclic unevenness applied to the sliver 10 is determined depending on a width of the grooves 29. Since the diameter is 25 mm and the number of the groove parts is 56 in the conventional third roller 200A, a cyclic unevenness applied by the third roller 200A becomes 25 mm × n/56 = 1.4 mm (n is nearly equal to 3.14) and has a periodicity of 1.4 mm in the calculation. By drafting the sliver 10 having a cyclic unevenness with a periodicity of 1.4 mm between the third roller pair 22 and the middle roller pair 23, and between the middle roller pair 23 and the front roller pair 24, respectively, the cycle of cyclic unevenness becomes longer. That is, at passage of the delivery roller 41, the cyclic unevenness applied by the conventional third roller 200A becomes 1.4 mm × 1.715 × 35/0.96 = 87.54 mm and has periodicity of 88 mm in the calculation.

As shown in Fig. 6, as a result of measurement by the yarn evenness tester, a peak 88 exists at the position of 88 mm, which corresponds to a calculation result.

[0038] On the other hand, since the diameter is 25 mm and the number of the groove parts is 72 in the third roller 22A, a cyclic unevenness applied by the third roller 22A becomes 25 mm × n/72 = 1.09 mm (n is nearly equal to 3.14) and has a periodicity of 1.1 mm in the calculation. By drafting the sliver 10 having a cyclic unevenness with periodicity of 1.1 mm, at passage of the delivery roller 41, the cyclic unevenness applied by the third roller 22A becomes 1.09 mm × 1.715 × 35/0.96 = 68 mm and has a periodicity of about 68 mm in the calculation.

However, as shown in Fig. 7, from the measurement results of the yarn evenness tester, no peak was found at the position of 68 mm. That is, in the draft device 2 having the third roller 22A, cyclic unevenness is not applied to the sliver 10.

[0039] As described above, if the third roller 22A which satisfies certain requirements is used, the cyclic unevenness caused by the groove pitch does not generate. In other words, when the third roller 22A has a large inclination with respect to the axial direction of the grooves 29 so that the grooves 29 are not be parallel with the tip end 10a of the sliver 10, a cyclic unevenness caused by the groove pitch does not generate. As certain requirements for preventing the cyclic unevenness, given that a diameter of the third roller 22A is R, the number of groove parts 71 of the third roller 22A is N, an inclination relative to the axial direction of the groove parts 71 is θ, the fiber width of the sliver 10 to be processed by the draft device 2 is D and a circular constant is n, the relationship nR/N < Dtanθ is established. If the third roller 22A has a predetermined relationship (nR/N < Dtanθ), irrespective of the material (yarn type) of the sliver 10, the cyclic unevenness caused by the groove pitch can be prevented. In addition, irrespective of the material (yarn type) of the sliver 10, a configuration of the third roller 22A can be standardized. For this reason, processing and rearrangement of the third roller 22A do not require trouble and costs.

[0040] Next, shape of the grooves 29 of the third roller 22A and the cyclic unevenness caused by the groove pitch of the draft roller will be described. Since the cyclic unevenness due to the groove pitch of the draft roller is generated by forming grooves on the roller surface, an occurrence of the cyclic unevenness can be prevented by increasing the number of groove parts formed on the roller surface. However, when the number of groove parts is increased, the depth of the groove parts inevitably becomes smaller. As a result, foreign materials such as cotton sugar, residue and the like are easy to accumulate. Thus, twisting and holding forces of fibers to the roller is lowered, thereby deteriorating yarn physical properties. Accordingly, it is necessary to increase the number of the groove parts formed on the roller surface, while increasing the depth of the groove parts.

[0041] Therefore, a spun yarn was actually manufactured by using each of the draft devices 2 having the conventional third rollers 200A, 210A, 220A and the draft device 2 having the third roller 22A according to an embodiment of the present invention, and the two cases are compared with respect to an extent in which foreign materials are accumulated on the third roller. Fig. 8 is a table showing shapes of the conventional third rollers 200A, 210A, 220A, and the third roller 22A.

[0042] Given that, for each third roller, the diameter is R (mm), the number of groove parts is N (pieces), an inclination relative to the axial direction of the groove parts is θ (degrees), the cross-sectional area of the groove parts, that is, an area surrounded by the inclined surfaces, a bottom surface and a virtual line of a virtual surface extending from a convex surface of the convex part is A (mm^2), a depth of the groove parts, that is, a height from the bottom surface to the virtual line is F (mm), a width of the bottom surface of the groove part in the roller circumferential direction is T (mm) and the width of the convex surface of the convex part in a roller circumferential direction is W (mm), the rollers having following values were used as the third rollers to be compared.

[0043] The conventional third roller 200A has R = 25 mm, N = 56, θ = 5 degrees, A = 0.28 mm^2, F = 0.43 mm, T = 0.40 mm and W = 0.50 mm. A cross-sectional profile of a groove part is substantially trapezoid.

[0044] The conventional third roller 210A has R = 25 mm, N = 90, θ = 5 degrees, A = 0.07 mm^2, F = 0.20 mm, T = 0.24 mm, and W = 0.40 mm. The cross-sectional profile of a groove part is substantially trapezoid.

[0045] The conventional third roller 220A has R = 25 mm, N = 120, θ = 5 degrees, A = 0.07 mm^2, F = 0.21 mm, T = 0.21 mm, and W = 0.20 mm. The cross-sectional profile of a groove part is substantially trapezoid.

[0046] The third roller 22A according to the present embodiment has R = 25 mm, N = 72, θ = 10 degrees, A = 0.175 mm^2, F = 0.35 mm, T = 0.30 mm and W = 0.40 mm. A cross-sectional profile of a groove part is substantially trapezoid.

[0047] The fiber width of the processed sliver 10 was 7.0 mm. As the processing conditions for the draft device 2, the draft ratio (IDR) of the third roller to the middle roller was set to 1.715, the draft ratio (MDR) of the middle roller to the front roller was set to 35, and the tensile strength of the delivery roller 41 was set to 0.96.

[0048] When the sliver 10 was processed under the above-mentioned conditions by using each of the draft devices 2 having the conventional third rollers 200A, 210A, 220A and the draft device 2 having the third roller 22A, in case of using the third roller 210A (N = 90, A= 0.07 mm^2, F = 0.20 mm, T = 0.24 mm) and the third roller 220A (N = 120, A = 0.07 mm^2, F = 0.21 mm, T = 0.21 mm), foreign materials were accumulated in the groove parts 211 and 221.

When the sliver 10 was processed by using each of the third roller 200A (N = 56, A = 0.28 mm^2, F = 0.43 mm, T = 0.40 mm) and the third roller 22A (N = 72, A = 0.175 mm^2, F = 0.35 mm, T = 0.30 mm), foreign materials were not accumulated in the groove parts 201 and 71.

[0049] When the third rollers (200A, 22A) which satisfy certain conditions are used, foreign materials are not accumulated in the groove parts. Given that a cross-sectional area of the groove parts is A (mm^2), a depth of the groove parts is F (mm) and a width of the bottom surface of the groove parts in the roller circumferential direction is T (mm), in the third rollers which satisfy the certain conditions, the cross-sectional area A of the groove parts falls within the range of 0.15 < A < 0.30, a depth F of the groove parts falls within a range of 0.3 < F < 0.45 and a width T of the bottom surface falls within a range of 0.25 < T < 0.45.

[0050] By allowing a cross-sectional area, a depth and a width of the bottom surface in a roller circumferential direction of the groove parts of the third roller to fall within the predetermined range, irrespective of the material (yarn type) for the sliver, foreign materials (cotton sugar, residue and the like) can be prevented from being accumulated in the groove parts. Furthermore, since a cross-section of the groove part of the third roller is trapezoid, foreign materials (cotton sugar, residue and the like) can be prevented from being accumulated in the groove parts.

[0051] As described above, when a groove structure of the third roller satisfies the relationship nR/N < Dtanθ (Equation 1), the cyclic unevenness due to the groove pitch does not generate. When groove structure of the third roller satisfies the relationship 0.15 < A < 0.30 (Equation 2), 0.3 < F < 0.45 (Equation 3) and 0.25 < T < 0.45 (Equation 4), foreign materials (cotton sugar, residue and the like) are not accumulated in the groove parts. Accordingly, if the groove structure of the third roller satisfies the relationship of Equation 1 to Equation 4, a generation of the cyclic unevenness caused by the groove pitch and the accumulation of foreign materials (cotton sugar, residue and the like) in the groove parts can be prevented.

Claims

1. A draft roller provided in a draft device (2) of a spinning machine (100), the draft roller comprising:

   groove parts (29) formed on a roller surface (28) of the draft roller and having an inclination relative to an axial direction of the draft roller, wherein

   given that a diameter of the draft roller is R, a number of the groove parts (29) is N, an inclination of the groove parts (29) relative to the axial direction is θ, a fiber width of a sliver processed by the draft device is D and a circular constant is n,

   the draft roller satisfies a relationship nR/N < Dtanθ.

2. The draft roller according to claim 1, wherein given that a cross-sectional area of the groove part is A mm^2,
   A falls within a range of 0.15 < A < 0.30.

3. The draft roller according to claim 1 or 2, wherein given that a depth of the groove part (29) is F mm, F falls within a range of 0.30 < F < 0.45.

4. The draft roller according to any of claims 1 to 3, wherein given that a width of a bottom surface of the groove part (29) in a roller circumferential direction is T mm,
   T falls within a range of 0.25 < T < 0.45.

Fig.1

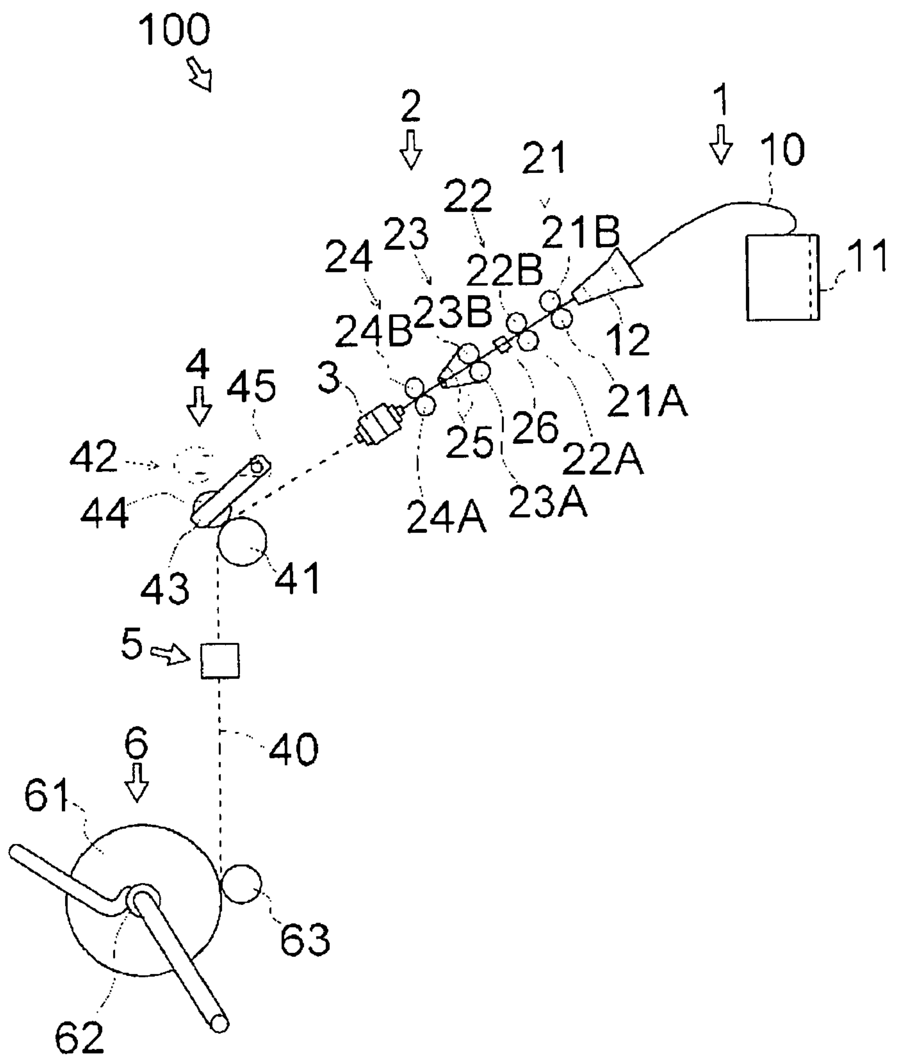
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Fig.2

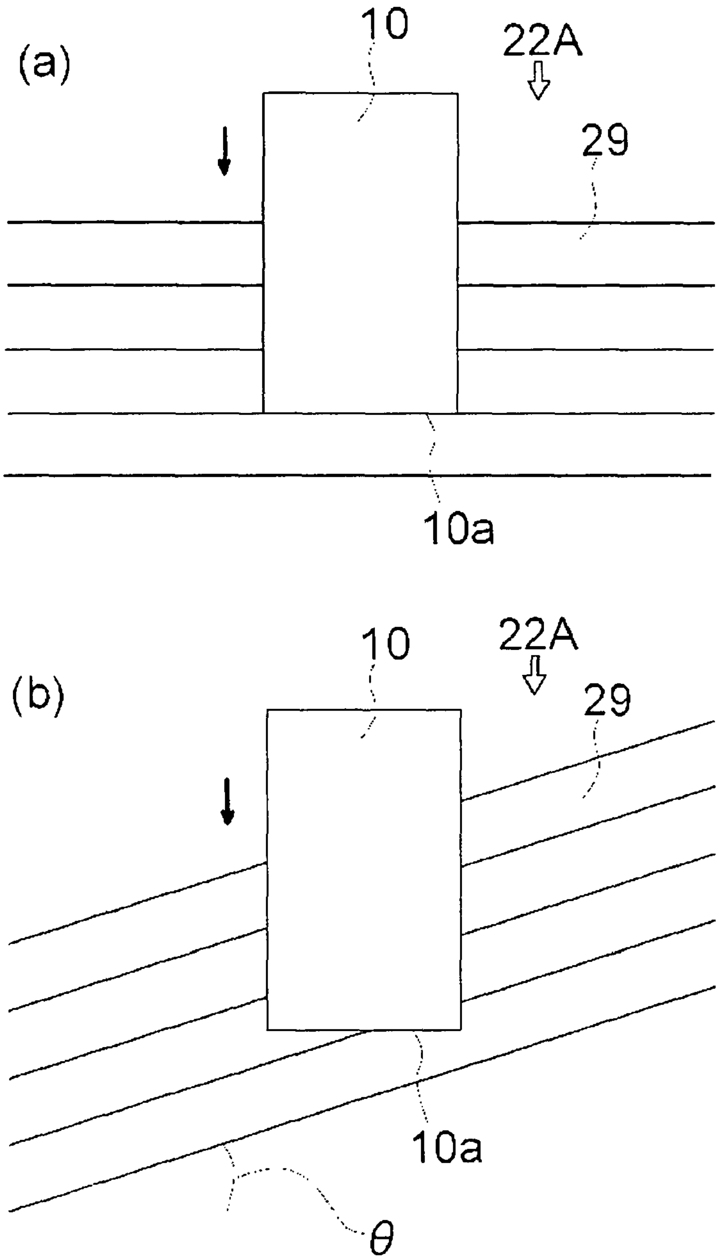

Fig.3

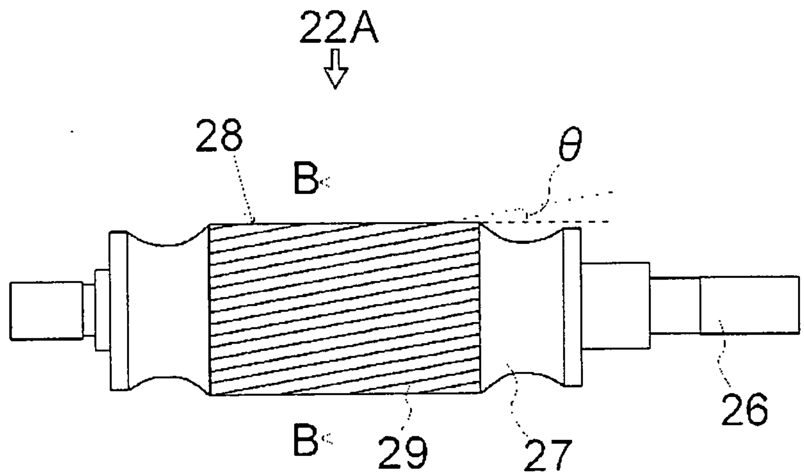

Fig.4

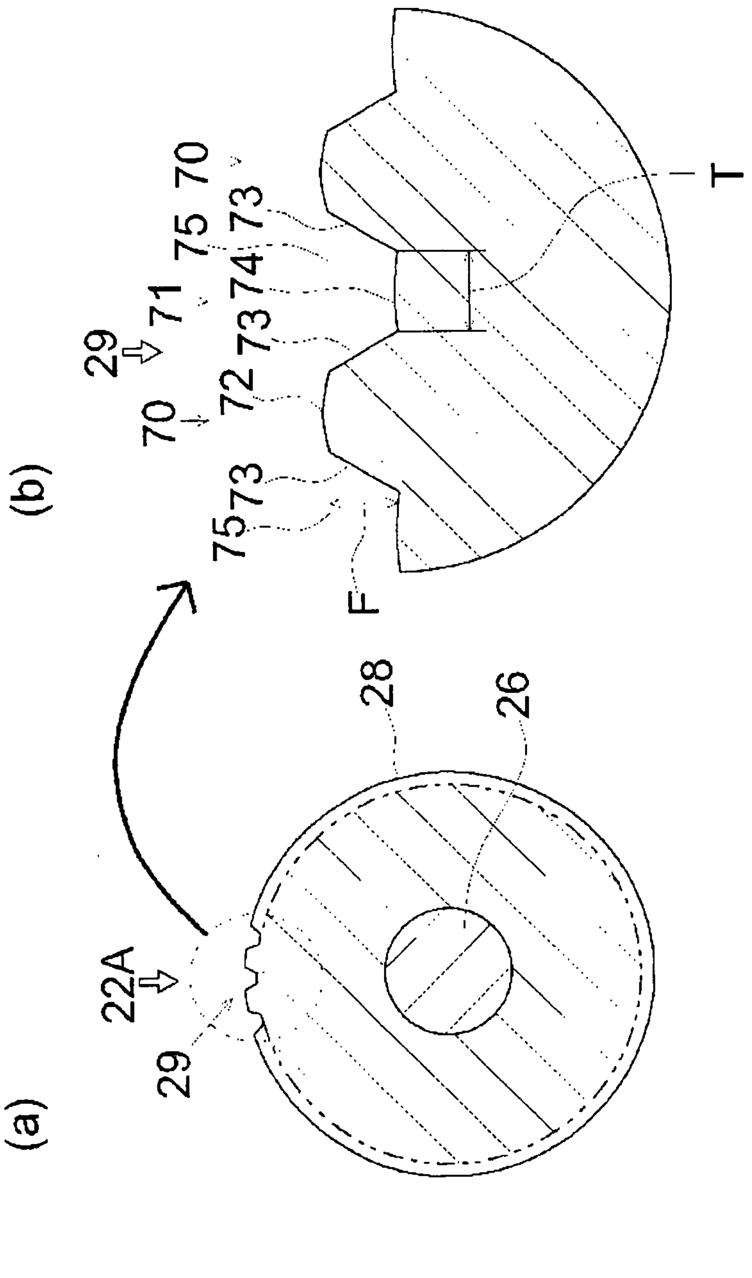

Fig.5

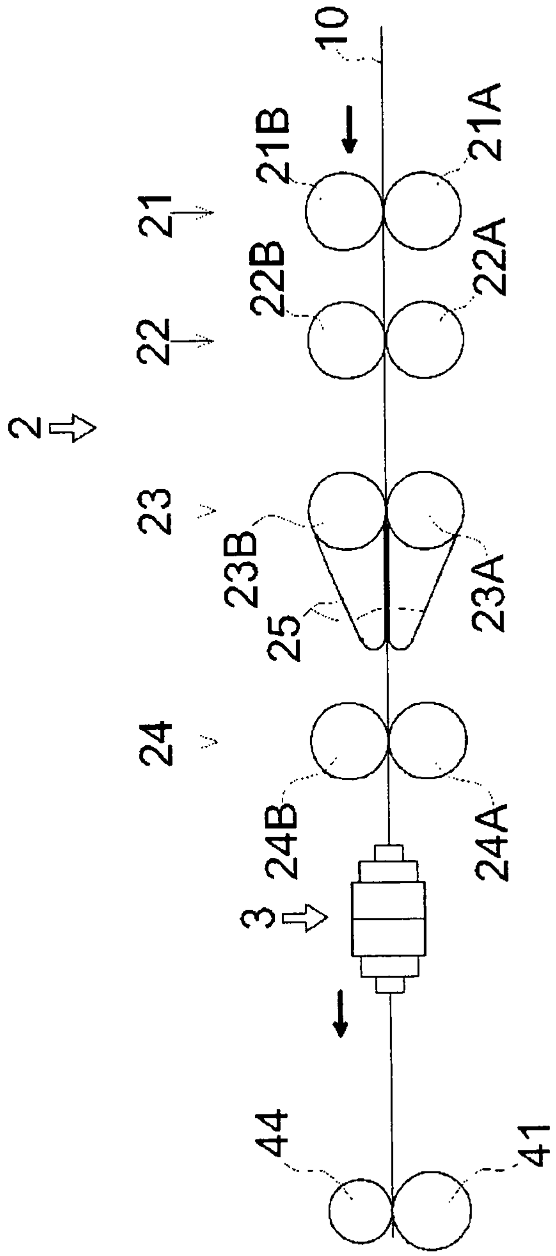

Fig.6

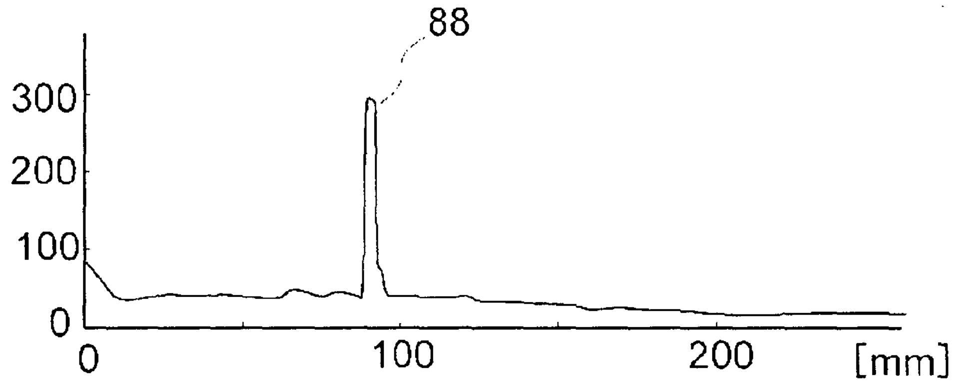

Fig.7

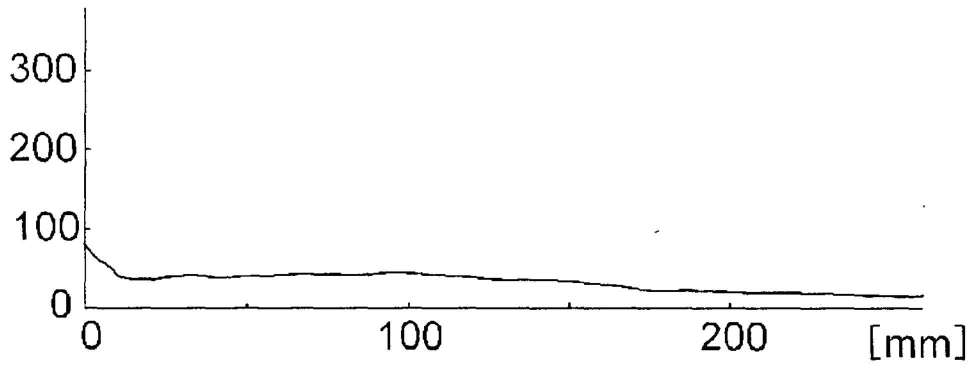

Fig.8

Third Roller	R(mm)	N(pieces)	θ (degrees)	A(mm²)	F(mm)	T(mm)	W(mm)	Accumulation of foreign materials
200A	25	56	5	0.280	0.43	0.40	0.50	Not Generated
210A	25	90	5	0.070	0.20	0.24	0.40	Generated
220A	25	120	5	0.070	0.21	0.21	0.20	Generated
22A	25	72	10	0.175	0.35	0.30	0.40	Not Generated

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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